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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/464,315	12/16/1999	TAN DU	TI-29436	7360
23494	7590	09/11/2006	EXAMINER CRAIG, DWIN M	
TEXAS INSTRUMENTS INCORPORATED P O BOX 655474, M/S 3999 DALLAS, TX 75265			ART UNIT 2123	PAPER NUMBER

DATE MAILED: 09/11/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/464,315

Applicant(s)

DU ET AL.

Examiner

Dwin M. Craig

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 21 August 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 28-37 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 28-37 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____.

DETAILED ACTION

1. A request for continued examination under 37 CFR 1.114 was filed in this application after appeal to the Board of Patent Appeals and Interferences, but prior to a decision on the appeal. Since this application is eligible for continued examination under 37 CFR 1.114 and the fee set forth in 37 CFR 1.17(e) has been timely paid, the appeal has been withdrawn pursuant to 37 CFR 1.114 and prosecution in this application has been reopened pursuant to 37 CFR 1.114. Applicant's submission filed on 8/21/06 has been entered.

Response to Arguments

2. Applicant's arguments with respect to claims 1-27 have been considered but are moot in view of the new ground(s) of rejection.

Claim Objections

3. Independent claims 28-37 are objected for the use of the acronym BEMF. The claim language should not contain any acronyms unless the meaning of the acronym is clearly disclosed, for example in this instance, Back Electro-Magnetic Force. Correction is required.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

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(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

4. Claims 28-30 are rejected under 35 USC 102(e) as being anticipated by US Patent

5,982,130 *Male*.

4.1 As regards independent claim 28, *Male* discloses, *a method of BEMF measurement*

(Abstract and Col. 1 lines 37-39), *comprising the steps of: (a) turning off a driver for a current in a first direction through a voice coil; (Figure 1B and Col. 5 lines 17-19 "...the velocity sense signal VEL SENSE generated by the VEL amp 20 is disconnected with the summation nnode AIN...") (b) after said turning off, estimating eddy currents induced by current in said first direction through said voice coil prior to said turning off; (Col. 5 lines 38-41 "...This is the zero-current back EMF value of VEL SENSE...") (c) for a time interval, turning on a driver for a current in a second direction through said voice coil, where said second direction is opposite said first direction and said time interval is determined from the results of said estimating (Col. 5 lines 43-52 and Figure 2); (d) after said time interval, measuring a BEMF of said voice coil (Col. 5 lines 66-67 and Col. 6 lines 1-5).*

4.2 As regards dependent claim 29 *Male* discloses, *wherein said estimating eddy currents is by timing a decay of flyback current through said voice coil following said turning off* (Col. 5 lines 38-41 "...This is the zero-current back EMF value of VEL SENSE...").

4.3 As regards dependent claim 30 *Male* discloses, *wherein said timing a decay includes measuring a voltage drop across a sense resistor in series with said voice coil* (Figure 1B "Rs 0.5" and Col. 3 lines 64-65).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the Malener in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

5. Claims 32, 33, 35 and 36 are rejected under 35 U.S.C. 102(e) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over US Patent 5,982,130 *Male*.

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5.1 Claims 32, 33, 35 and 36 are being rejected because the cited reference *Male* discloses a substantially similar product as disclosed by applicants claimed limitations.

The *Male* reference teaches a product that appears to be the same as, or an obvious variant of, the product set forth in a product-by-process claim although produced by a different process. See *In re Marosi*, 710 F.2d 799, 218 USPQ 289 (Fed. Cir. 1983) and *In re Thorpe*, 777 F.2d 695, 227 USPQ 964 (Fed. Cir. 1985). See also MPEP § 2113.

5.2 As regards independent claim 32 *Male* substantially teaches, *a voice coil circuit, comprising: (a) a current driver for a voice coil (Figure 1B and Col. 1 lines 45-57); (b) a positioning control circuit coupled to said current driver; (Figure 1A & 1B) (c) an estimator control circuit coupled to said current driver circuit and to said positioning control circuit; (Figures 1A & 1B) and (d) a BEMF measuring circuit coupled to said current driver (Col. 1 lines 60-65); (e) wherein said estimator control circuit is operable to: (i) be enabled by said positioning circuit releasing control of said current driver; (ii) determine a time interval; and (iii) control said current driver to drive a current through said voice coil during said time interval and in a direction opposite to direction of current through said voice coil just prior to said positioning circuit releasing control of said current driver.*

The examiner notes that disclosed voice coil circuit in *Male* performs *Back –EMF* estimation as the disclosed claimed invention and therefore *Male* discloses the same resultant product as Applicants' are claiming.

5.3 As regards dependent claim 33, *Male* substantially discloses, *wherein said estimator control circuit determines said time interval by timing decay of a flyback current after said*

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positioning control circuit releasing control of said current driver (Col. 5 lines 38-41 "...This is the zero-current back EMF value of VEL SENSE...").

5.4 As regards independent claim 35 *Male* substantially teaches, *A hard disk drive* (Col. 1 lines 32-34), *comprising: (1) at least one disk with a magnetic film coating; (this is inherent in a disk drive) (2) a read/write head assembly with a voice coil for positioning over said disk (Figure 1B and Col. 1 lines 45-57); (3) a voice coil circuit connected to said voice coil, including: (a) a current driver for said voice coil (Figures 1A & 1B); (b) a positioning control circuit coupled to said current driver (Col. 1 lines 17-65); (c) an estimator control circuit coupled to said current driver circuit and to said positioning control circuit (Col. 1 lines 35-67); and (d) a BEMF measuring circuit coupled to said current driver (Figures 1A & 1B); (e) wherein said estimator control circuit is operable to: (i) be enabled by said positioning circuit releasing control of said current driver; (ii) determine a time interval; and (iii) control said current driver to drive a current through said voice coil during said time interval and in a direction opposite to direction of current through said voice coil just prior to said positioning circuit releasing control of said current driver.* It is noted by the examiner that the cited *Male* reference substantially teaches all of the same resultant functionality of the disclosed claimed hard disk drive product.

5.5 As regards dependent claim 35 *Male* substantially discloses, *wherein said estimator control circuit determines said time interval by timing decay of a flyback current after said positioning control circuit releasing control of said current driver* (Col. 5 lines 38-41 "...This is the zero-current back EMF value of VEL SENSE...").

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6. Claims 31, 34 and 37 are rejected under 35 USC 103(a) as being unpatentable over US Patent 5,982,130 *Male* in view of US Patent 5,191,297 *Penman*.

6.1 As regards dependent claim 31, *Male* does not expressly disclose, *wherein said turning off of step (a) includes turning off a first pair of transistors in an H-bridge connected to said voice coil and between a power supply and a power sink, and wherein said turning on of step (c) includes turning on a second pair of transistors of said H-bridge.*

However, *Penman* substantially teaches using an H-bridge with a pair of transistors acting as a current mirror (Figure 1 and Col. 1 lines 48-53 and Col. 2 lines 39-64).

Male and *Penman* are analogous art because they are from the similar field of endeavor of disk drive controller systems.

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to modify the drive controller electronics of *Male* with an H-Bridge amplifier with a current mirror as disclosed in *Penman*.

The suggestion for doing so would have been to provide *lossless load sensing* which provides for greater efficiency and greater bandwidth of the amplifier during loaded operation (see *Penman* Col. 1 lines 26-41 and Col. 2 lines 3-14), also, the examiner knows from personal knowledge that current mirrors and H-bridges are well known in the disk drive controller art and have been used in the control of voice coil motors for over 15 years.

Therefore it would have been obvious to combine *Penman* with *Male* to obtain the invention as specified in claims 31, 34 and 37.

6.2 As regards dependent claim 34, *Male* does not expressly disclose, *wherein said current driver includes an H-bridge with said voice coil and a current sense resistor connected between*

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legs of said H-bridge and a power supply and a power sink connected to ends of respective legs of said H-bridge, and each leg includes a transistor plus a flyback diode.

However, *Penman* substantially teaches using an H-bridge with a pair of transistors acting as a current mirror (Figure 1 and Col. 1 lines 48-53 and Col. 2 lines 39-64).

6.3 As regards dependent claim 37, *Male* does not expressly disclose, *wherein said current driver includes an H-bridge with said voice coil and a current sense resistor connected between legs of said H-bridge and a power supply and a power sink connected to ends of respective legs of said H-bridge, and each leg includes a transistor plus a flyback diode.*

However, *Penman* substantially teaches using an H-bridge with a pair of transistors acting as a current mirror (Figure 1 and Col. 1 lines 48-53 and Col. 2 lines 39-64).


Conclusion

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dwin M. Craig whose telephone number is (571) 272-3710. The examiner can normally be reached on 10:00 - 6:00 M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Paul L. Rodriguez can be reached on (571) 272-3753. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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9/8/06